SolarTech Permitting Committee Initiative

Online Permit Application Interoperability Standard

Phase I Draft and Phase II Industry Challenge

Removing barriers to adoption and reducing Solar PV Permit cycle time

Authors: David McFeely, Siew Lim, Karen Aidi

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SolarTech would like to acknowledge the following individuals for their support and contribution in creating the Online Permit Application Interoperability Standard.

SolarTech Executive Management

Tom McCalmont

Chair, SolarTech Board
President & CEO, McCalmont Engineering

Carl Guardino

Vice Chair, SolarTech Board
President & CEO, Leadership Group

Doug Payne

Executive Director
SolarTech

David McFeely

Principal Author
Director of Grants and Government Programs

SolarTech Permitting Committee Project Team

Greg Sellers

Chair, SolarTech Permitting Committee
President, Burnham Energy

Eric Alderman

Co Chair, SolarTech Permitting Committee
President, SolarNexus

Siew Lim

Professional Volunteer supporting the Solar Industry

Melody Sepehri

Professional Volunteer supporting the Solar Industry

Elizabeth Khaghani

Professional Volunteer supporting the Solar Industry

Karl Kovac

Professional Volunteer supporting the Solar Industry

Karen Aidi

Professional Volunteer, Document Preparation

Table of Contents

1 Background

The application and approval process for solar PV construction permits is well recognized by the industry as a inefficient process with hidden costs born by the integrator. Solar ABCS has developed streamlining guidelines to address this concern. Several software companies have begun to offer online permitting services. However, without additional software standards, the industry risks creating software islands of inefficiencies replacing the current inefficient manual process. SolarTech envisions and has published a draft set of software interoperability specifications that would facilitate the following:

- Any integrator initiating a permit application over the web could expect a relatively similar experience regardless of the city or county building department or software solution provider contracting with the city or county (AHJ).
- All process steps and interactions are time stamped to facilitate process improvement analysis.
- All resulting data is archived in a secure accepted manor and transferrable between any two vendors.
- All data can be outputted for process improvement analysis by either the source vendor or the AHJ; and certain data can be accessed, consolidated and analyzed by SolarTech for state and nation-wide process improvement needs.

To understand this proposal and its goals, simply look at your own internet experience. Any individual can access any application on any kind of hardware over the internet from any location. Why? Because software and hardware developers adhere to standards such as Java, DHCP, TCIP, HTML, HTTP, XML, SMTP, POP3, etc. Standards made the information super highway what it is today, and can significantly streamline the solar permit super highway of tomorrow. Standards are the grease of productive commerce.

2 Target Audience

This document is written with several players (stakeholders) in mind who have roles and responsibilities that either directly or indirectly relate to the online permitting process. Some of these players require conceptual process information, while others, particularly software vendors, require enough technical information to understand the proposed interoperability standard.

These stakeholders include:

- City building departments that must approve and inspect photovoltaic system installations
- Solar integrators (contractors) who install photovoltaic systems

- Software vendors who develop Web-based permit applications to expedite the manual building process for photovoltaic systems

- Utility companies that connect the photovoltaic installations to the power grid and provide rebate incentives to consumers

3 SolarTech Approach

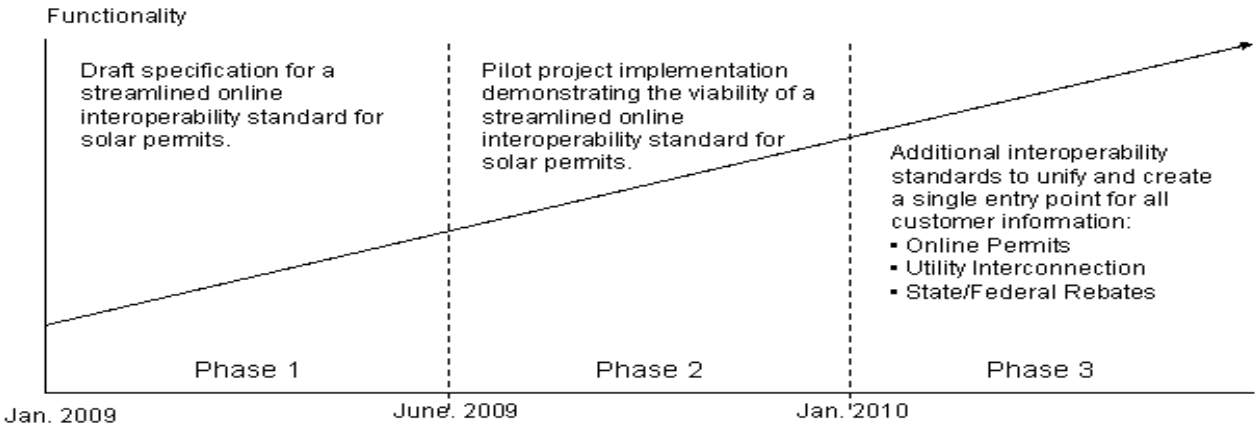
It is important to note that this document represents Phase I of the Online Permit Application process interoperability standard, and, as such, it describes a general approach to automating the building permit process and its interfaces to the various stakeholders.

This approach makes it easier to understand the proposed software standard as a means of communication between the stakeholders. Because this document describes a proposed online solution, it is also important to note that this solution has yet to be prototyped or tested.

Phase I has been funded in part by the California Energy Commission PIER Grant program. The goal is to develop enough of a conceptual solution on paper to justify funding of Phase II and III, as illustrated in the next figure. Interested parties can contact and discuss supporting this initiative by contacting Debbie Lee:

Debbie Lee
Director of Member Services and Standards
SolarTech
1290 Parkmoor Ave.
San Jose, CA 95126
408-655-9130
dlee@solartech.org

The next figure shows the expected timeline for the SolarTech phased approach for implementing a software standard to address the automation and reporting on photovoltaic systems.

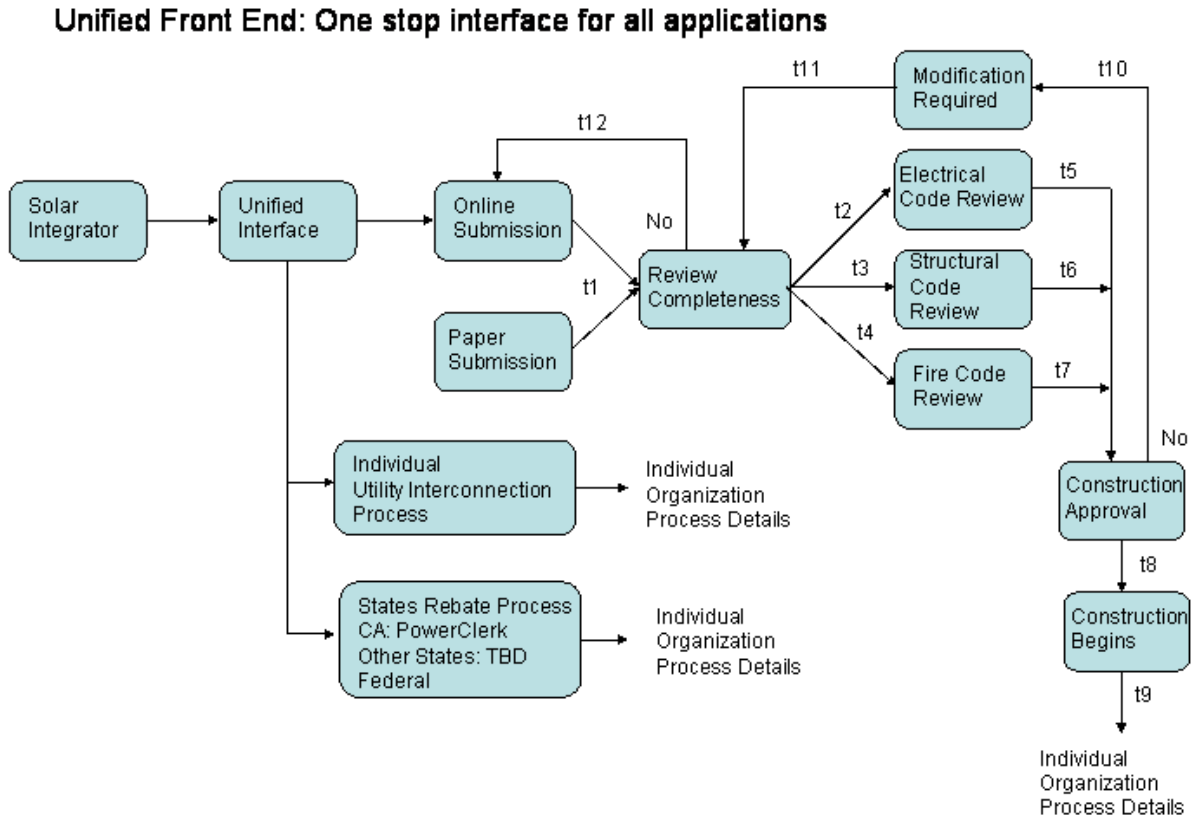


4 Overall Process Flow and Interfaces

Before discussing the interoperability software standard, it is necessary to understand the permitting process, its steps, and how this process relates to other related processes. Beside the city or county building department, the individual utility companies must provide the necessary interconnection to the power grid and the state must provide customer rebates for installing the photovoltaic system.

For documentation purposes the words city and county are synonymous with each other. Depending on the installation site, the customer could fall under either a city or county jurisdiction.

The next figure shows how these processes relate to each other from a high-level point of view.



To expedite the overall process flow, there is a concept of the time it takes to perform the various steps involved in each process step. This is represented by time 1 (t1), time 2 (t2), time 3 (t3), and so on. The SolarTech data exchange file captures the data necessary to track the time between steps by using timestamps (software checkpoints). For example, it can track the time it takes from when the initial permit application is received until the required paper work is complete.

The processes involved in automating the entire online building process include:

- Online permitting process and typical city/county permit review process
- Individual utility interconnection process and individual state rebate process (California uses the PowerClerk application for this purpose)

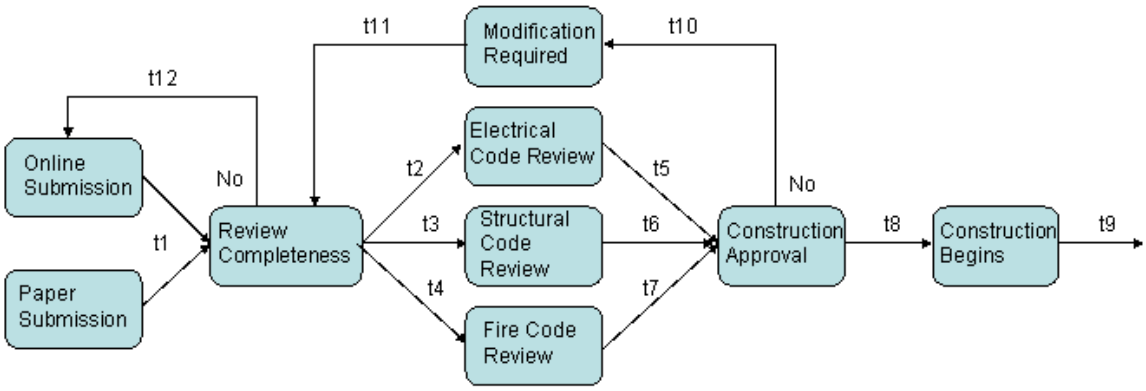
SolarTech bases its automated permit process largely on Brooks Engineering's *Expedited Permit Process for PV Systems* versions 3 and 4 that was prepared for the Solar America Board of Codes and Standards (Solar ABCS) as a starting point for its interoperability standard. For up-to-date information and the latest Brooks documentation, see http://www.brooksolar.com/files/Expedited_Explanation-5-6-09.pdf. The next sections describe these processes in more detail.

4.1 Typical Online City/County Permitting Process

The first step in the permitting process, whether it is a manual or online process, is to check the permit application for completeness. This process includes reviewing supporting documentation such as the site plan for the PV system, the electrical diagram showing the PV array configuration, as well as the specification sheets and installation manuals for all manufactured components pertaining to the particular PV system to be installed. Many cities also require a fire review in the permitting process.

The next figure shows a typical online permit approval process flow in a city building department from a high-level point of view.

Online Permit Process and Typical City/County Permit Review Process Flow



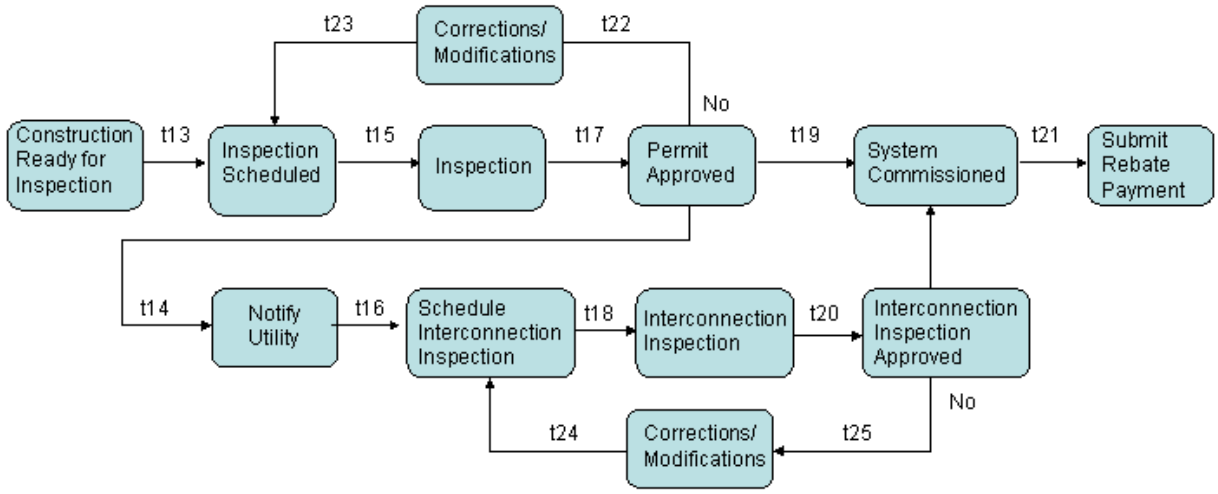
Time points represent reporting points for stakeholders and analysis data gathering point for SolarTech

Once the permit is approved, the construction of the PV system can begin and the city inspects the installation. Once the city approves the installation, the system can be connected to the power grid.

4.2 Individual Utility Interconnection and Rebate Processes

After the installation inspection is complete and the PV system is fully commissioned, the utility interconnection inspection process begins. The next figure shows the intersection of the online permitting process and how the final inspection and subsequent utility interconnection inspection process occurs. After the installation passes the city and utility inspections, the customer qualifies for the rebate.

Online Permit Process for Final Inspection and Interaction with Utility Interconnection Inspection Process

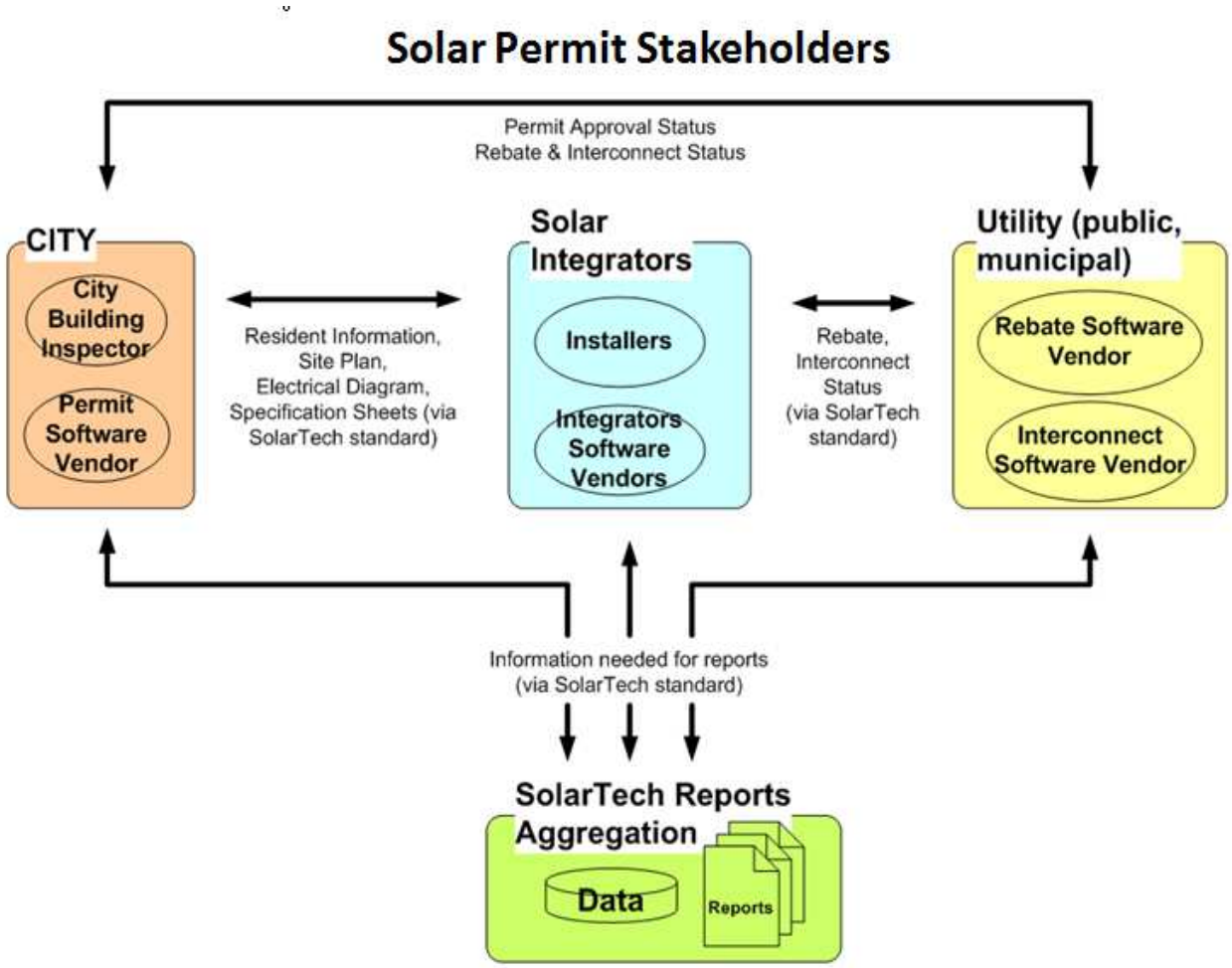


5 Solar Permit Stakeholders and Software Components

This section describes the solar permit stakeholders, their roles in the online permitting process, and the interface standard that is needed in XML format for a viable online permitting solution. XML is rapidly becoming the de-facto standard to communicate between different Internet applications. For this reason, SolarTech proposes to use XML as its interoperability standard to:

- Manage the software interfaces required among the different stakeholders
- Set limits on the specific parameters required in the building process

It is important to note that this format is in proposal form and has not yet been reviewed by the advisory board. The next figure shows the solar permit stakeholders involved with the overall permitting process and how the proposed software and interested parties interfaces integrate with each other.



5.1 Solar Permit Stakeholder Roles

The next sections describe the various stakeholders, who they are, their roles, and how it is expected that they will interface with each other in an automated fashion.

5.1.1 Software Providers

Software Providers (vendors) develop and offer various types of software services to cities and Solar Integrators. Software providers can provide these services either as an onsite tool that the city can purchase licenses for, and install on a city-owned server; or as a remote service such the “software as a service” (SAAS) model that the city would purchase remote licenses for.

This interoperability standard for the online permitting software is intended to facilitate the connection and communication between various software providers to ensure a unified and standardized solution for any solar integrator applying for permits from any city using software from any software provider.

Each software provider is responsible for maintaining the primary database for city clients as part of the service offering. Solar integrators can look up who the contact person is at the city and make their own inquiries.

5.1.2 City

The **City** issues building permits, inspects, and approves the PV installation. It is expected that the city will adopt the standardized permit process recommended by Solar ABCS, and then take advantage of online permitting software to track permit applications and exchange permit status via the SolarTech format with solar integrators, utilities, and with SolarTech.

Each city building department is responsible for keeping its own individual database. Solar integrators can look up who the contact person is at the city and make their own inquiries.

SolarTech pulls data from the cities, integrators, utilities, and so on for statistical use and process improvements.

5.1.3 Solar Integrators

The **Solar Integrators** are the **installers** (essentially contractors) of PV systems or their subcontractors and who use the SolarTech format to communicate with the city on the site plan and electrical information, and with utility companies for the interconnection application. Data is also sent to SolarTech for reporting purposes.

5.1.4 Utilities

The **Utilities** are companies such as the three California Investor Owned Utilities (P.G. & E., Southern California Edison, and San Diego Gas & Electric), or the many municipal utilities such as SMUD, SV Power, City of Palo Alto Utilities, and others who would use the SolarTech format to communicate with the cities and integrators in real-time, therefore, accelerating the lead time for the interconnection and rebate processes.

5.1.5 SolarTech

SolarTech is a collaborative non-profit organization whose mission is to create a Solar Center of Excellence in Silicon Valley. The purpose is to identify, prioritize, and resolve technical and adoption barriers to solar technology by addressing issues of performance, processes, standards, and workforce readiness.

SolarTech intends to publish and maintain the XML exchange standard for all stakeholders. All stakeholders can participate in the advisory board to influence the standard. In addition, SolarTech aggregates and generates reports for data analysis purposes.

The standardized SolarTech format enables seamless real-time communication with all current and future stakeholders, for example, cities, integrators, utilities, and SolarTech, which accelerates the entire permitting application process.

6 SolarTech XML Exchange Standard

The XML schema language is published by the World Wide Web Consortium (W3C) to describe the structure and content of data and documents. This language is widely used on the Web especially for business-to-business (B2B) applications.

SolarTech recommends the use of the XML schema as its exchange file format due to its many advantages:

1. XML schema is already a recognized Web standard for describing and exchanging documents. Many computer languages, editors, and databases already have built-in support for it.

2. XML schema language supports multiple data types and data formats.

3. XML schema language allows for restriction rules and data pattern definition.

4. XML schema is robust and flexible; therefore, it allows the SolarTech Exchange Standard to create clear, concise rules and validation for those rules.

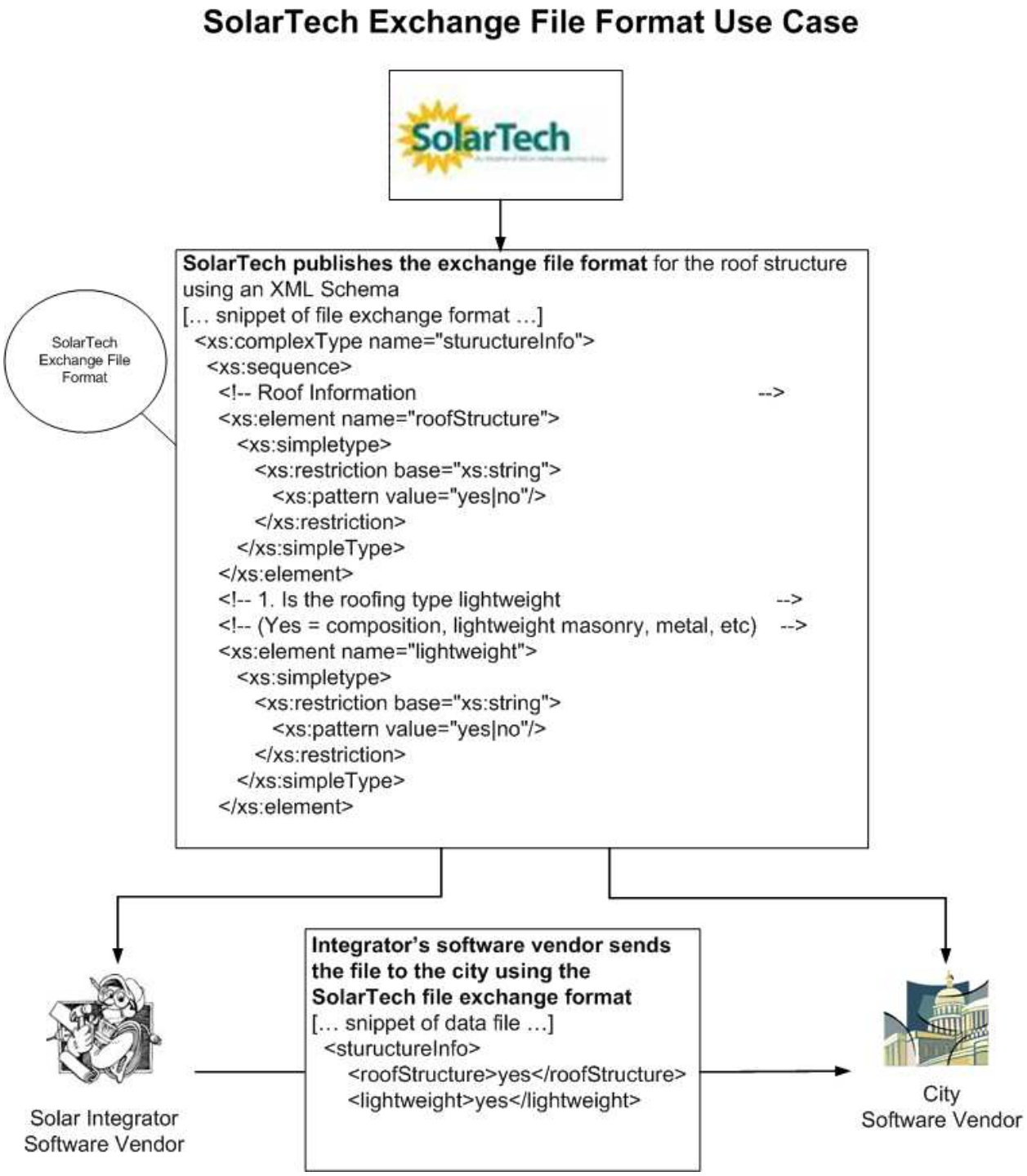
6.1 XML Exchange Standard Purpose

The purpose of the XML exchange standard is to allow all required permitting information data to be captured by the city software vendor, the solar integrator software vendor, and SolarTech. Once the data is captured in a flat file, it can be stored as tables in any commercial database, and information can be exchanged among the interested parties. SolarTech will have the ability to run reports on the captured data.

It is important to note that this document is conceptual in its nature; therefore, it does not intend to represent the complete XML template file or specification here. Rather, it provides some example XML constructs to illustrate how the manual process steps translate into automated XML constructs. In particular, it shows an example of how the electrical and structural information components could be represented using keyword names and captured data. Once the standard is approved, SolarTech intends to publish the complete XML exchange specification.

Comments in the XML schema are represented with an open angle bracket, an exclamation point with two dotted lines, and a close angle bracket with two dotted lines.

The next figure shows a typical use case example of an exchange between the solar integrator’s software vendor and the city’s software vendor.



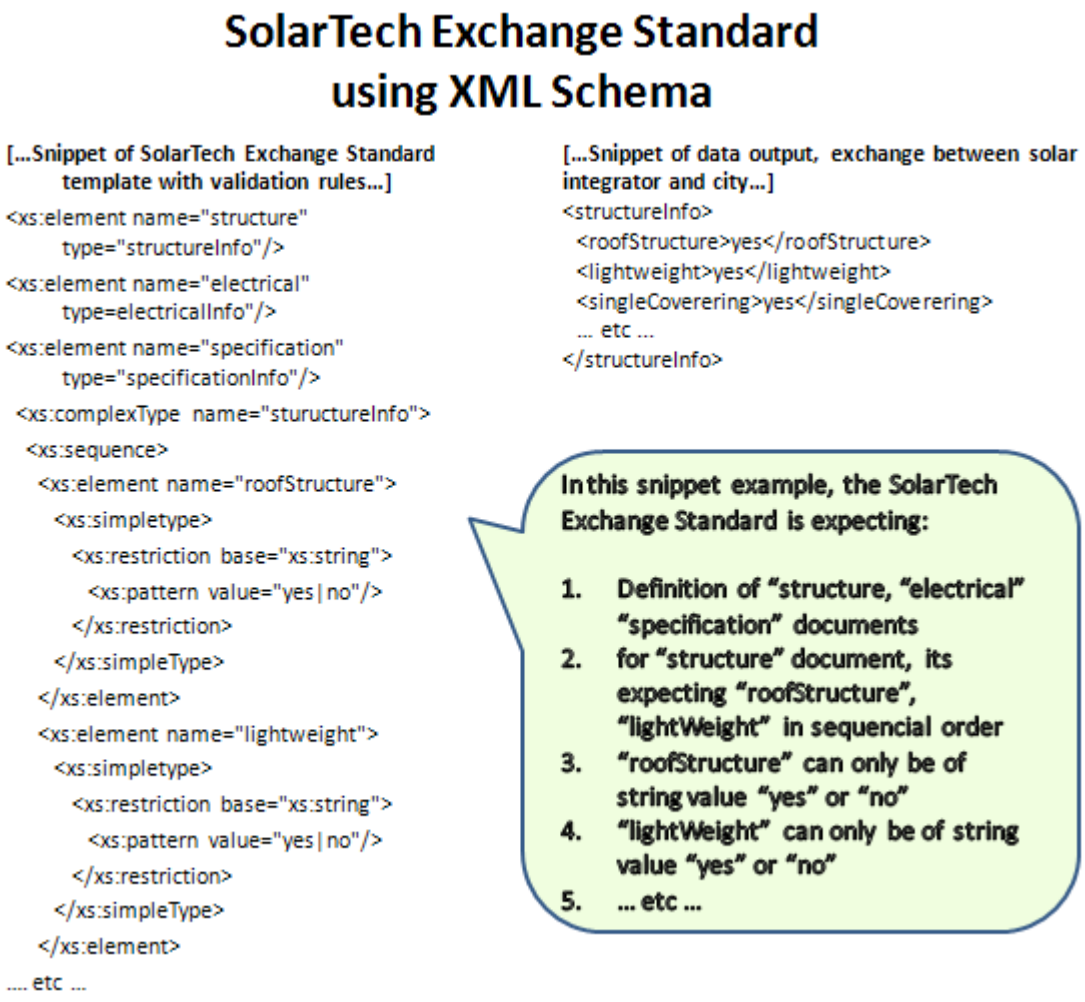
6.2 SolarTech XML Schema Examples

The next sections describe the proposed XML file format standard in more detail and some of the required data that allows for automation of the permitting process.

These sections assume familiarity with the engineering specification where the steps involved in an expedited permit process for small-scale PV systems are described and some familiarity with XML.

6.3 XML Inputs and Outputs

The next figure shows the SolarTech Exchange file format template on the left with some of its corresponding validation rules. For example, to pass the structural review, the structural document requires a parameter that describes the type of roof structure for the PV installation. Similarly, the roof structure element expects a yes or no string value.



The XML constructs include certain keywords, such as the structural, electrical, and other specification documentation required for the solar permit. The keywords require the user to fill in the details. In some cases, certain questions must be answered requiring a yes or no value, in other cases, more descriptive information is required, for example, the name of the manufacturer of photovoltaic system, or a decimal value, for example, the total surface area of the PV modules in square feet.

The next sections show how required steps for the permitting process translate into XML constructs.

6.3.1 Input Documents Example

Step 1 of the expedited permitting process requires a site plan showing the location for major components, an electrical diagram showing the PV array system configuration, wiring system, overcurrent protection, inverters, disconnects, and so on.

The next XML example shows how the structural, electrical, and supporting manufacturer specification details are defined in XML schema.

```
<xs:element name="structure" type="structureInfo"/>
<xs:element name="electrical" type=electricalInfo"/>
<xs:element name="specification" type="specificationInfo"/>
and so on…
and so on…
```

When additional requirements are necessary, the XML schema can be modified to allow for the definition of new elements to support additional requirements of the permitting process.

6.3.2 Structural Review Documentation Example

Step 2 of the expedited permitting process requires an electrical review of the PV system (calculations for the electrical diagram) before installing the PV system. In particular, the site plan for the solar installation includes information such as the roof structure, whether it is lightweight (composition, lightweight masonry, metal, wood, and so on,) a single covering, and what kind of weatherproofing it has, and so on.

The front-end application will need to address these structural review items and the data will need to be captured in the XML exchange file.

The next XML example shows how the structural documentation requirements for the permitting process are represented in the XML schema. Yes or no values and names use string values while model numbers or weight values use decimal notation.

```
<xs:complexType name="stuructureInfo">
 <xs:sequence>
  <xs:element name="roofStructure">
   <xs:simpletype>
    <xs:restriction base="xs:string">
     <xs:pattern value="yes|no"/>
    </xs:restriction>
   </xs:simpleType>
  </xs:element>
  <xs:element name="lightweight">
   <xs:simpletype>
    <xs:restriction base="xs:string">
     <xs:pattern value="yes|no"/>
    </xs:restriction>
   </xs:simpleType>
  </xs:element>
  <xs:element name="singleCoverering">
   <xs:simpletype>
    <xs:restriction base="xs:string">
     <xs:pattern value="yes|no"/>
    </xs:restriction>
   </xs:simpleType>
  </xs:element>
  <xs:element name="weatherproofing" type="xs:string"/>
```

Define content for the structural review in sequence.
Is roofing type lightweight? Yes or No.
1. **Yes**.

Does the roof have a single covering? Yes or No**.**
2. **Yes**.
3. Provide method and type of weatherproofing roof penetrations.

6.3.2.1 PV System Mounting Information

Part of the structural review includes details on the PV modules to be installed. In particular, these details include the mounting system manufacturer, the product name and model number, the weight of the PV modules and rails, the total surface area for the PV modules, and so on.

The next XML example shows how the PV mounting instructions for the permitting process are represented in the XML schema. Again, simple names, such as the manufacturer and product name use string values while model numbers, weight values, surface areas, total number of attachment points and so on use decimal notation.

```
<xs:element name="pvMounting">
        <xs:simpletype>
          <xs:restriction base="xs:string">
            <xs:pattern value="yes|no"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:element>
      <xs:element name="manufacturer" type="xs:string"/>
      <xs:element name="productName" type="xs:string"/>
      <xs:element name="modelNumber" type="xs:decimal"/>
      <xs:element name="weigth" type="xs:decimal"/>
      <xs:element name="attachment" type="xs:decimal"/>
      <xs:element name="railSpace" type="xs:decimal"/>
      <xs:element name="surfaceArea" type="xs:decimal"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

Define PV mounting information in sequence.

1. Provide mounting system manufacturer.
2. Provide product name.
3. Provide model number.
4. Provide total weight of PV modules and rails in lbs.
5. Provide total number of attachment points.
6. Provide total surface area for PV modules in square feet.
7. …and so on…

6.3.3 Electrical Review Documentation Example

Step 2 of the expedited permitting process also requires an electrical review of the PV system and the calculations for the electrical diagram. This includes the definition of the PV modules, utility-interactive inverters, and combiner boxes in PV systems.

```
<xs:complexType name="electricalInfo">
  <xs:sequence>
    <xs:element name="UL1741">
      <xs:simpletype>
        <xs:restriction base="xs:string">
          <xs:pattern value="yes|no"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:element>
    <xs:element name="utilityInteractive">
```

Define electrical review information in sequence. There are three options for source circuit conductors, so one must be chosen. Fuses are required in most cases, so calculations must be provided.

1. Provide option: UL1741.
2. Provide calculations.

```
            <xs:simpletype>
              <xs:restriction base="xs:string">
                <xs:pattern value="yes|no"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:element>
          <xs:element name="UL1703">
            <xs:simpletype>
              <xs:restriction base="xs:string">
                <xs:pattern value="yes|no"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:element>
          <xs:element name="Max600v">
            <xs:simpletype>
              <xs:restriction base="xs:string">
                <xs:pattern value="yes|no"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:element>
          <xs:element name="Compose4Strings">
            <xs:simpletype>
              <xs:restriction base="xs:string">
                <xs:pattern value="yes|no"/>
              </xs:restriction>
            </xs:simpleType>
          </xs:element>
          <xs:element name="Compose15kw">
    <xs:simpletype>
      <xs:restriction base="xs:string">
        <xs:pattern value="yes|no"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="Output13.44K">
    <xs:simpletype>
      <xs:restriction base="xs:string">
        <xs:pattern value="yes|no"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="NEC690.64b">
    <xs:simpletype>
```

```
      <xs:restriction base="xs:string">
        <xs:pattern value="yes|no"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="electricalDiagram">
    <xs:simpletype>
      <xs:restriction base="xs:string">
        <xs:pattern value="yes|no"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="inverterManufacturer" type="xs:string"/>
  </xs:element>
  <xs:element name="inverterModel" type="xs:decimal"/>
  </xs:element>
  <xs:element name="maxV" type="xs:decimal"/>
  </xs:element>
  <xs:element name="maxPower" type="xs:decimal"/>
  </xs:element>
  <xs:element name="nominalAC" type="xs:decimal"/>
  </xs:element>
  <xs:element name="maxOCPD" type="xs:decimal"/>
  </xs:element>
  <xs:element name="inverterPDF">
    <xs:simpletype>
      <xs:restriction base="xs:string">
        <xs:pattern value="yes|no"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:element>
  <xs:element name="moduleManufacturer" type="xs:string"/>
  </xs:element>
  <xs:element name="moduleModel" type="xs:string"/>
  </xs:element>
  <xs:element name="moduleMaxA" type="xs:decimal"/>
  </xs:element>
  <xs:element name="moduleMaxV" type="xs:decimal"/>
  </xs:element>
  <xs:element name="moduleOpenV" type="xs:decimal"/>
  </xs:element>
  <xs:element name="moduleShortA" type="xs:decimal"/>
  </xs:element>
```

Define the electrical diagram information in sequence.

1. Provide inverter manufacturer.
2. Provide inverter model number.
3. Provide AC point of connection (**NEC690.64b**).
4. Provide some inverter calculations.
5. Provide PV module manufacturer.
6. Provide PV module type.
7. Provide PV module calculations.
8. …and so on…

```
<xs:element name="moduleMaxOCPD" type="xs:decimal"/>
</xs:element>
<xs:element name="moduleMaxPmax" type="xs:decimal"/>
</xs:element>
<xs:element name="moduleSystemV" type="xs:decimal"/>
</xs:element>
<xs:element name="arrayModule" type="xs:decimal"/>
</xs:element>
<xs:element name="arrayParallel" type="xs:decimal"/>
</xs:element>
<xs:element name="arrayLowTemp" type="xs:decimal"/>
</xs:element>
<xs:element name="arrayHighTemp" type="xs:decimal"/>
</xs:element>
<xs:element name="signsSource" type="xs:string"/>
</xs:element>
<xs:element name="signsCurrent" type="xs:decimal"/>
</xs:element>
<xs:element name="signsVoltage" type="xs:decimal"/>
</xs:element>
<xs:element name="signsMaxV" type="xs:decimal"/>
</xs:element>
<xs:element name="signsMaxA" type="xs:decimal"/>
</xs:element>
<xs:element name="signsNEC690.17" type="xs:string"/>
</xs:element>
<xs:element name="signsNEC690.54" type="xs:string"/>
</xs:element>
<xs:element name="signsOutputA" type="xs:string"/>
</xs:element>
<xs:element name="signsNominalV" type="xs:string"/>
</xs:element>
<xs:element name="wiringDC" type="xs:string"/>
</xs:element>
<xs:element name="wiringAC" type="xs:string"/>
</xs:element>
<xs:element name="wiringACConnection" type="xs:string"/>
</xs:element>
<xs:element name="GroundingSystem" type="xs:string"/>
</xs:element>
<xs:element name="GroundingEquipment" type="xs:string"/>
</xs:element>
<xs:element name="GroundingConductor" type="xs:string"/>
```

Provide information on system grounding. All systems with operation >50 V have one conductor reference to ground (NEC 690.410) unless the system complies with 690.35 for ungrounded PV arrays.

1. Provide equipment grounding.
2. Provide sizing of grounded conductor.

```
    </xs:element>
   </xs:sequence>
  </xs:complexType>
</xs:element>
```

7 City Database

As a part of the overall effort to streamline and expedite the permitting process, SolarTech is developing a comprehensive city database for installers, which includes the following information:

- Key contacts at each city, for example, the names of the planners and inspectors and their respective e-mail addresses and phone numbers
- Overview of permitting process
- Over the counter or online options
- Whether planning review is required
- Documents required for the building permit
- Other unique requirements for that city
- Permit fees for standard residential and commercial solar installations
- Number of installations per year (where available)
- Other information relevant to solar installers

8 SolarTech Report Format and Parameters

As a part of the overall effort to streamline and expedite the overall solar permitting process, SolarTech can create reports that gather information about the permit, the installer, and the time it takes to perform certain tasks, for example, reviewing the necessary PV system documentation, performing the inspection, installing the PV system, hooking up the system with the utility company, and getting the rebates returned to the customer.

The ability to create and analyze reports can reveal several interesting data points, and can answer questions such as:

- How long does it take on average to get a rebate back from the state?
- How long does it take to perform an electrical review in Santa Clara as opposed to San Jose?
- How long does the entire end-to-end process take and how many permits were rejected?

Once these data points are gathered and analyzed, suggestions for process improvements can be provided, thus lowering the cost of business and further reducing the barriers for PV system adoption.

This section does not specify how the reports look, but rather the data points that could be of interest. One possible format is to create some type of spreadsheet that can be downloaded from the Internet that allows end-users to sort and organize the data as they see fit.

The next table shows some of the parameters that could be included in SolarTech reports. The parameters that are included in the reports will vary depending on the type of information that is most beneficial to gather and analyze.

Most of these parameters are self-explanatory and correspond to the various steps in a typical online permitting process flow.

Report Parameter	Description
City Name	The name of the city or county jurisdictional body that approves the PV system permit application.
Site Location	The site where the PV system installation takes place, whether residence, public facility, or commercial installation site. Note that each site has a site plan that shows the location of major components on the property. It is a required documentation component to get a permit for a PV system. It can be attached electronically as a PDF file or submitted manually.
Solar Integrator Name	The name of the installer or contractor responsible for installing the PV system.
Solar Integrator Contact Information	The contact information for the solar system installer or contractor of the PV system. At a minimum, this typically includes a contact phone number and an email address, but it could also include the street address for the solar integrator.
Online Submission	The date and time the initial permit application is submitted to the city. Required documents can be provided electronically as PDF attachments or submitted manually. This process is determined by the city.
Review Completeness Time	The total time it takes for the city to review all required documentation steps including electrical code review, structural code review, and fire code review and what modifications, if any, were required during the permitting process until review completeness is done and the construction of the PV system can begin.
Electrical Code Review Time	The time it takes for the city to complete the electrical code review.
Structural Code Review Time	The time it takes for the structural code review, if required. As part of the structural review for the PV system, mounting system information

	is a required documentation component. It includes the manufacturer of the system, the product name and model number among other things.
Fire Code Review Time	The time it takes for the city to complete the fire code review, if required.
Modification Approval (if needed)	The time it takes from the denial of a building permit application to the approval of modifications that were required for review completeness to occur.
Construction Approval Time	The time it takes for the city to approve the solar permit.

These parameters are just a subset of all of the possible parameters and are for illustration purposes only. As processes evolve, SolarTech can include additional parameters for reporting purposes in future phases of the interoperability standard. It is anticipated that SolarTech will utilize this data to continue to refine and improve the permitting process.

9 SolarTech Architectural Overview and Design Implementation

This section provides an architectural overview and its intended design for the expedited solar permit application process. SolarTech has some responsibilities in the process; however, all interested parties including the cities and solar integrators will also have responsibilities.

In particular, solar integrator software vendors will need to create unique identifiers for each customer and each permit application and the cities will need to provide a progress feedback loop to SolarTech so that reports can be generated and analyzed.

To prototype the online permit application solution, the software system needs seed data. SolarTech has the following responsibilities for this technical implementation:

- SolarTech must publish the exchange standard and seed data
- SolarTech must provide seed data to cities, solar integrators, and utilities
- SolarTech must provide a progress feedback loop (city to SolarTech)

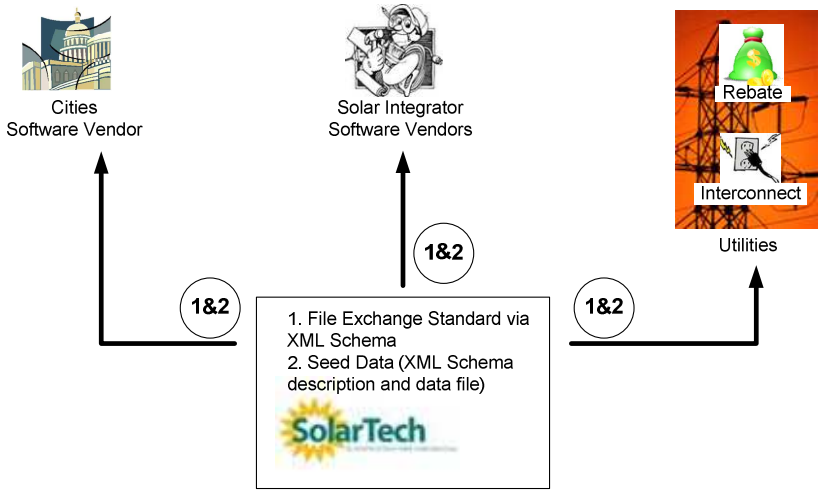
9.1 SolarTech Standard and Seed Data

SolarTech is responsible for the following steps:

1. **Publish the complete exchange standard for the entire end-to-end solar permitting process.**
   Stakeholders such as the cities, solar integrators, and utilities as well as their corresponding software vendors will be notified of this fact. Stakeholders are included in the advisory group to guide the SolarTech exchange standard. It is possible that this standard may consist of one complete XML exchange file or broken up into separate exchange files for ease of use and maintainability purposes.

2. **Publish the seed data necessary to all stakeholders.**
   Seed data consists of name value pairs, that is, certain keyword names and their values that are applicable to the city, solar integrator, and utility. These keywords have numeric values associated with them, for example, the city of San Jose might have a unique identifier such as the number 10. Additional seed data consists of software checkpoints that allow for the tracking of the time it takes between the various process steps, that is, t1, t2, t3 and so on.

The next figure shows steps **1** and **2** in this process, that is, the creation of the file exchange specification for all parties involved in the process as well as the seed data that all parties require, that is, seed data for the cities, solar integrators, and utilities.



The next sections describe the XML implementation in more detail, that is, the name value pairs or "primary keys" and the required "seed data" that are necessary to prototype the automated software solution. To set up the foundation and format so that each city, solar integrator, and utility can talk with each other, SolarTech must assign a unique ID (number) for each player's seed data. The SolarTech data design includes a "catch-all" row for all unknown or undetermined cities, integrators, and utilities.

9.1.1 City Seed Data

This section describes the city seed data and how it is represented in the XML exchange file. Each city must have its own unique identifier, known as the **CityID**.

Primary Key: CityID

Requirement: Each city has a row in the table, uniquely identified by its **CityID**. Once the city is associated with **CityID**, the ID and its city association will never, ever change. This is to preserve data integrity. SolarTech creates a catch all row for an unknown or undetermined city.

The next table shows how a **CityID** with the numeric value of **-1000** is reserved for an unknown or undetermined city. It also shows that the city of San Jose has a unique identifier of **10**, created on **1/1/09** by **SolarTech**. In addition, the file includes data such as the modification date column, modified by column, and comments column.

CityID	CityName	Creation_Date	Created_By	Modification_Date	Modified_By	Comments
-1000	Unknown	1/1/09	SolarTech			Catch All Others
10	San Jose	1/1/09	SolarTech			

9.1.2 Solar Integrator Seed Data

This section describes the solar integrator seed data (shortened to integrator) and how it is represented in the XML exchange file. Each solar integrator must have its own unique identifier, known as the **IntegratorID**.

Primary Key: IntegratorID

Requirement: Each solar integrator has a row in the table, uniquely identified by its **IntegratorID**. Once the integrator is associated with **IntegratorID**, the ID and its integrator association will never, ever change. This is to preserve data integrity. SolarTech creates a catch all row for unknown or undetermined solar integrators.

The next table shows how an **IntegratorID** with the numeric value of **-1000** is reserved for an unknown or undetermined integrator. It also shows that the solar integrator named **SolarCity** has a unique identifier of **10**, created on **1/1/09** by **SolarTech**. In addition, the file includes data such as the modification date column, modified by column, and comments column.

IntegratorID	Integrator Name	Creation _Date	Created_ By	Modification _Date	Modified _By	Comments
-1000	Unknown	1/1/09	SolarTech			Catch All Others
10	SolarCity	1/1/09	SolarTech			
20	Akeena	1/1/09	SolarTech			

9.1.3 Utility Seed Data (Public and Municipal)

This section describes the utility seed data and how it is represented in the XML exchange file. Each utility must have its own unique identifier, known as the **UtilityID**.

Primary Key: UtilityID

Requirement: Each utility has a row in the table, uniquely identified by its **UtilityID**. Once the utility is associated with **UtilityID**, the ID and its utility association will never, ever change. This is to preserve data integrity. SolarTech creates a catch all utility row for an unknown or undetermined utilities.

The next table shows how a **UtilityID** with the numeric value of **-1000** is reserved for an unknown or undetermined utility. It also shows that the utility named **PG&E** has a unique identifier of **10**, created on **1/1/09** by **SolarTech**. In addition, the file includes additional data such as the modification date column, modified by column, and comments column.

UtilityID	UtiilityName	Creation _Date	Created_ By	Modification _Date	Modified _By	Comments
-1000	Unknown	1/1/09	SolarTech			Catch All Others
10	PG&E	1/1/09	SolarTech			
20	SMUD	1/1/09	SolarTech			

9.1.4 Checkpoint Seed Data for Progress Feedback Tracking

This section describes the checkpoint seed data and how it is represented in the XML exchange file. Each process step must have its own unique checkpoint identifier, known as the **CheckPointID**.

Primary Key: CheckPointID

Requirement: Each checkpoint has a row in the table, uniquely identified by its **CheckPointID**. Once the checkpoint is associated with **CheckPointID**, the ID and its checkpoint association will never, ever change. This is to preserve data integrity. SolarTech creates a catch all checkpoint row for an unknown or undetermined checkpoints.

The next table shows how a **CheckPointID** with the numeric value of **-1000** is reserved for an unknown or undetermined checkpoint. It also shows that each process step in the online application has a unique identifier. For example, Permit Application Received has a unique identifier of **10**, created on **1/1/09** by **SolarTech** and is owned by the city. In addition, the file includes data such as checkpoint name, owner of the checkpoint, creation date column, created by column, modification date column, modified by column, and comments column.

Each one of these checkpoints corresponds to t1, t2, and t3 described earlier in this document.

CheckPointID	CheckPointName	Owner	Creation_Date	Created_By	Modification_Date	Modified_By	Comments
-1000	Unknown	All	1/1/09	SolarTech			Catch All Others
10	Online Submission (permit application received)	City	1/1/09	SolarTech			
20	Permit Application Paperwork Complete	City	1/1/09	SolarTech			
30	Electrical Code Review	City	1/1/09	SolarTech			
40	Structural Code Review	City	1/1/09	SolarTech			
50	Fire Code Review	City	1/1/09	SolarTech			
60	Construction Approval (permit application approved)	City	1/1/09	SolarTech			
70	Construction Approval Denied (permit application rejected)	City	1/1/09	SolarTech			

80	Corrections/Modifications (permit application suspended)	City	1/1/09	SolarTech			
90	City Inspection Scheduled	City	1/1/09	SolarTech			
100	Permit Approved (city inspection completed)	City	1/1/09	SolarTech			
110	Submit Rebate Payment (Rebate Application Received)	Rebate	1/1/09	SolarTech			
120	Rebate Application Approved	Rebate	1/1/09	SolarTech			
130	Rebate Application Rejected	Rebate	1/1/09	SolarTech			
140	Rebate Application Suspended	Rebate	1/1/09	SolarTech			
150	Rebate Paid	Rebate	1//1/09	SolarTech			
160	Interconnection Application Received	Interconnection	1/1/09	SolarTech			
170	Interconnection Application Approved	Interconnection	1/1/09	SolarTech			
180	Interconnection Application Rejected	Interconnection	1/1/09	SolarTech			
190	Interconnection Application Suspended	Interconnection	1/1/09	SolarTech			
200	Interconnection Inspection Scheduled	Interconnection	1/1/09	SolarTech			
210	Interconnection Inspection Completed	Interconnection	1/1/09	SolarTech			
220	Interconnection to the Grid	Interconnection	1/1/09	SolarTech			

9.2 Integrator and Integrator Software Vendor Responsibilities

As mentioned previously, both solar integrators and their software vendors will need to create unique identifiers for each of their customers and for each permit application. The city will need to inspect the solar panel installation. Once the inspection passes, the solar integrator sends the utility the application, so the interconnection to the power grid can proceed. Finally, the state must issue a rebate to the customer.

To automate the permitting process, the three interested parties: solar integrator, solar integrator software vendor and the utility must coordinate closely with each other to exchange data and are responsible for the following steps:

3. **(Solar Integrator) ensures that the home owner (customer) signs a contract for the solar panel installation.**

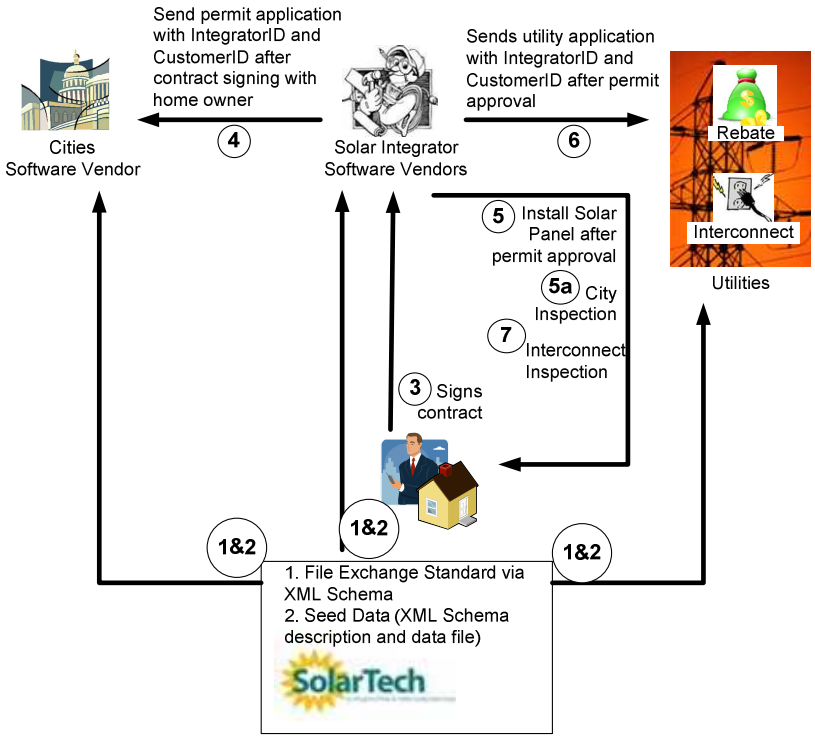
4. **(Solar Integrator Software Vendor) must create the necessary Customer IDs and Integrator IDs after the contract is signed.**
   This composite key data: **IntegratorID** and **CustomerID** ensures that all customers are uniquely identified each across all (multiple) integrator software vendors. The solar integrator software vendor must create a unique identifier per customer and per permit. For example, if the customer has two residential homes and wants to install solar panels on both homes, there will be two customer IDs because two separate permits are required. The **CustomerID** might be the same or different from **UtilityCustomerID**. The Utility **CustomerID** is defined by utility company, for example, the customer number or account number on the PG&E bill.
   In addition, each solar system integrator has a unique integrator ID as required for the necessary integrator seed data.

5. **(Solar Integrator) must install the solar panels after the permit approval.** After the permit approval, solar panels are installed and inspected by the building inspector.

6. **(Solar Integrator Software Vendor)** After permit approval and panel installation, the integrator software vendor submits the rebate application via www.powerclerk.com. The application is also sent to the utility for interconnection purposes.

7. **(Utility)** After the utility inspection and approval, the panels are connected to the grid.

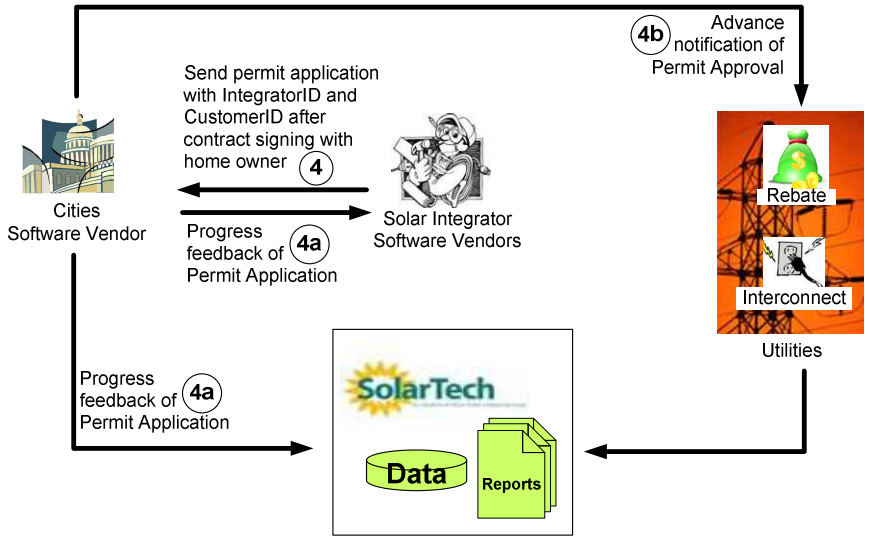
The next figure shows how steps **1** and **2** integrate with steps **3** through **7** in this process.



9.3 Cities Provide Progress Feedback Loop to Stakeholders

The city continuously provides progress feedback to the solar integrator and SolarTech via the data exchange format published by SolarTech. The final feedback of the permit application is an approval, suspension, or rejection of the permit. Feedback should include all city checkpoints identified previously in section 9.1.4.

The next figure shows how steps **4, 4a**, and **4b** integrate with the feedback loop for the reporting and data aggregation process.



To succeed in this progress feedback loop, the following requirements must be met:

- Each city has a unique City ID based upon section 9.1.1.
- For each permit application, the city receives a **CustomerID**, an **UtiliityID**, and an **IntegratorID** from the integrator.
- A city can generate a permit application number, but because there is no centralized key generation across all cities, this permit application number is not considered unique across all cities. It is recommended that the composite key of **CityID**, **UtilityID**, **IntegratorID**, and **CustomerID** be used to uniquely identify the permit application across all cities and all integrators.

9.3.1 Cities to Stakeholders Feedback Loop Examples

The next examples show what the required feedback records might look like for step **4a** based on the records shown in the next table. The full requirements will be specified in the XML schema to be published by SolarTech.

Record ID	CityID	UtilityID	IntegratorID	Customer ID	Check Point	Checkpoint StartDate	Check Point	CheckPoint StartDate
1	10	10	10	S928L3	40	1/5/09	60	1/10/09
2	10	10	20	20777	30	1//7/09	40	1/8/09

Examples:

Record #1, customer S928L3, San Jose (cityID=10) has a structural review (CheckpointID = 60) on Jan 5, 2009 and approved (CheckpointID=60) on Jan 10, 2009. The integrator is SolarCity (IntegratorID=10) and utility company is PG&E.

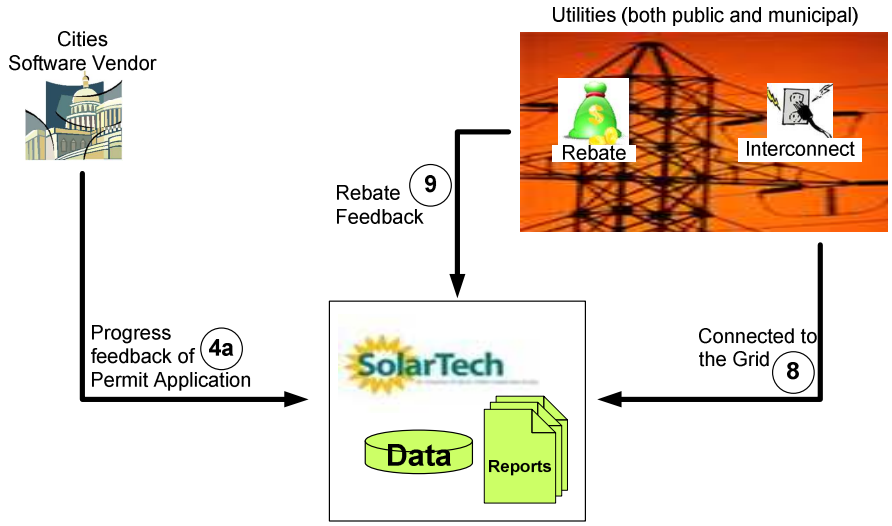
Record #2, customer 20777, San Jose (cityID=10) has electrical review (CheckpointID = 30) on Jan 7, 2009 and structural review (CheckpointID = 40) on Jan 8, 2009. Integrator is Akeena (IntegratorID=20) and utility company is PG&E

If the permit application is approved, the city sends advance notification to the utility company (see step **4b**).

9.4 SolarTech Reporting and Data Aggregation

To support data aggregation for reporting purposes, there must be a feedback loop to SolarTech. The frequency of the feedback loop is to be determined, for example, the feedback could be in real-time, every couple of hours, or two to three times a day.

The next figure shows how steps **4a**, **8**, and **9** integrate with the reporting and data aggregation process.



To succeed in this reporting and data aggregation function, the following requirements must be met:

- Each utility has a unique Utility ID based upon section 9.1.1.
- For each rebate application, the utility receives a **CustomerID** (defined by integrator), **UtiltyCustomerID** defined by utility, for example, the PG&E customer/account number, and **IntegratorID** from the integrator. The **CustomerID** and **UtilityCustomerID** may or may not be the same, depending on the integrator.
- SolarTech gets feedback from the cities and utilities (rebate and interconnection) to aggregate data for reporting purposes. Feedback data may need scrubbing to eliminate possible duplicative information.
- Composite key of **CityID**, **IntegratorID**, **CustomerID** and **UtilityID** will always uniquely identify each record in the entire system.

9.4.1 Interconnection to SolarTech Feedback Loop Examples

The interconnection application process continuously provides progress feedback to SolarTech via the published data exchange format. The final feedback of the interconnection application is an approval, suspension, or rejection status. The feedback should include all checkpoints identified in section 9.1.4.

The next table shows examples of the feedback required. Full requirements are specified in the XML schema published by SolarTech.

RecordID	CityID	UtilityID	IntegratorID	Customer ID	Check Point	Checkpoint StartDate	Check Point	CheckPoint StartDate
1	10	10	10	S928L3	160	1/15/09	200	1/17/09
2	10	10	20	20777	210	1/18/09	220	1/30/09

Examples:

This section describes how to read the tabular data presented in the table above.

Record #1, shows a customer S928L3 in San Jose (cityID=10) has an interconnection application received (CheckpointID =160) on Jan. 15, 2009 and interconnection inspection scheduled (CheckpointID = 200) on Jan 17, 2009. The solar integrator for this installation is SolarCity (IntegratorID=10) and utility company is PG&E.

Record #2, shows a customer 20777 in San Jose (cityID=10) has an interconnection inspection completed (CheckpointID = 210) on Jan. 18, 2009 and connected to the grid (CheckpointID = 220) on Jan 30, 2009. The solar integrator for this installation is Akeena (IntegratorID=20) and utility company is PG&E.

9.4.2 Rebate Feedback Loop Examples

The rebate application process continuously provides progress feedback to SolarTech via the published data exchange format. The final feedback of rebate application is an approval, suspension, or rejection status. The feedback loop must include all checkpoints identified in section 9.1.4.

The next table shows examples of the feedback required. The full requirements are to be specified in the complete XML schema published by SolarTech.

RecordID	CityID	Utility ID	IntegratorID	Customer ID	Check Point	Checkpoint StartDate	Check Point	CheckPoint StartDate
1	10	10	10	S928L3	110	1/14/09	120	1/30/09
2	10	10	20	20777	110	1//17/09	150	2/3/09

Examples:

This section describes how to read the tabular data presented in the table above.

Record #1, shows a customer S928L3 in San Jose (cityID=10) filed a rebate application (CheckpointID =110) on Jan. 14, 2009 and a rebate approval occurred (CheckpointID = 120) on Jan 30, 2009. The solar integrator is SolarCity (IntegratorID=10) and the utility company is PG&E.

Record #2, shows a customer 20777 in San Jose (cityID=10) filed a rebate application (CheckpointID = 110) on Jan. 17, 2009 and the rebate was paid (CheckpointID = 1500) on Feb. 3, 2009. The solar integrator is Akeena (IntegratorID=20) and the utility company is PG&E.

10 Summary and Next Steps

Over the course of six months a team of very dedicated volunteers with seed funding from the Energy Commission have been able to craft and draft the first ever interoperability standard for automating the solar building permit process. This effort is concluded and described in this document for comment and feedback by the various stakeholders previously described. As with so many other economic and business activities, it is clear that the solar PV industry would benefit from:

1. A standardized process flow that solar integrators could learn and depend on.
2. An online process that allows integrators from any location to file permit requests and check on status.
3. An interoperability standard that allows multiple software vendors to participate and serve multiple city building departments.
4. An interoperability standard that allows industry associations, such as SolarTech, to perform analysis on the efficiency and effectiveness of the permitting process and offer feedback and guidance to all stakeholders.

SolarTech is committed to removing the hidden barriers to the market growth of solar PV, and proposes to the industry that this document describes a viable and state-of-the-art solution to a known major problem: securing a solar PV building permit.

10.1 Next Steps

Phase II is a pilot project implementation, refining the standards, and driving adoption. In order to drive this initiative forward and to have it vetted by the largest possible audience, SolarTech has elected to pursue the next phase as an industry challenge.

Why:

- Jump-start this important industry initiative of the Permitting Committee.
- Realize an implementation and pilot project through industry support.
- To achieve real success in the quickest period of time.
- Creates conversation, engagement and action. Have some fun creating some buzz and publicity around an important industry initiative.

This industry challenge was publically announced at the “Execution and Implementation” track at Solar Power International 2009 in Anaheim, Calif.

Fundamental Goal

A functional demonstration before an audience of 500 plus attendees representing integrators, manufacturers, utilities, city and county political leaders, and building officials at SolarTech's Annual Summit, April 2010.

Demonstration Goals, Terms and Conditions

Any viable team can join the process at any time up through midnight March 31, 2010.

However for logistical and marketing purposes, interested parties should notify SolarTech by email before November 30, 2009, with January 31st as the final drop dead date. Beyond that date, program planning gets difficult with the run-down to the Summit. A late entry would have to have a very compelling justification to allow a late entry.

Required goals and deliverables

1. A pilot project demonstrating functional capabilities at SolarTech's Annual Summit, April 21-22, 2010 (date subject to change without notice).
2. A Revised Draft Specification, based on the demonstration pilot implementation submitted to SolarTech's Permitting Committee for final review and ratification.

Demonstration terms and conditions

The demonstration goal is interoperability and not simply an internet version of an isolated over-the-counter paper process. Therefore, the structure below is designed to pull teams together from multiple diverse groups to drive collaboration towards a common solution. The process objective is conversation and collaboration between solar integrators, cities, counties, utilities, and standards bodies such as SolarTech, Solar ABCS, IREC, etc.

An acceptable (successful) team must include at least the following:

- Two or more independent software vendors or software development teams in collaboration developing independent solutions based on the SolarTech draft specification. Any business, university or private group can participate.
- Two or more city or county permit jurisdictions (AHJ) in participation and collaboration on implementation and demonstration (advisory and demonstration roles).
- The City of San Jose must be one of the AHJs.
- SolarTech must be able to access and analyze the required defined data through defined access protocols.
- Must be demonstrated by and acceptable to two or more solar PV integrators who have solar PV permit application experience over multiple years.
- Participation from at least one utility to demonstrate linkage and coordination of permit and interconnect activities automatically over the internet.

- One member of the collaboration should be identified as the project lead and notify SolarTech of the team and the team's intent by November 30, 2009 to be considered for the Dec 3rd announcement, and no later than January 31, 2010 for final evaluation in April 2010. The project team lead will work closely with SolarTech on technical and marketing issues.

SolarTech envisions the ideal demonstration at our Summit (on stage) as follows: Four laptop stations linked to the internet (real time). Two laptops would represent independent city jurisdictions (actual city participation required), for which two integrators (real people) will attempt to apply for a solar permit. The third laptop represents a utility partner linking in the process relationship between permitting and utility interconnect. The forth laptop is manned by SolarTech/CPUC studying and analyzing confidential aggregated results against CSI goals.

Most important, each integrator should be able to experience and demonstrate a similar efficient permit application experience regardless of which demonstration laptop used.

Each city/county permit jurisdiction should feel comfortable that the application addresses their needs for cost effectiveness and ensuring public safety.

The winning demonstration team will enjoy front and center stage at the SolarTech Summit (April 2010) in front of 400 to 500 stakeholders in Solar PV industry.

Challenge Terms and conditions

- All development work must initially be based on SolarTech's draft specification for permit software interoperability; the Solar ABCS specification for solar permitting; and the IREC specification for utility interconnect. Improvements to any of these three specifications must be forwarded back to the respective standards owner for further study and ratification by the respective standards body.
- SolarTech owns the copyright and IP rights to the draft standard and any and all resulting modifications to the draft standard.
- Software teams/firms own the copyright to their individual implementation of the SolarTech software standards. It is assumed that the participating software teams/firms intend on pursuing this a service business offering to cities and counties. SolarTech intends to fully support and enable those business objectives within the boundaries of SolarTech certified processes and standards.
- AHJs (cities and counties) own the individual permit application data resulting from usage of any software implementation in normal course of AHJ business operations.
- Software teams/firms are responsible for data integrity and the safe archival of AHJ data.
- Changes and modifications to the SolarTech draft standard are expected (one of the deliverables) and must be submitted to the SolarTech Permitting Committee for final standards ratification.
- Software collaboration teams in partnership with city and county building officials should begin with the Solar ABCS permit guidelines and IREC Utility Interconnect guidelines; and

proceed forward with the vision that a single unified process that can be adopted state-wide is preferable.

- Interested teams must notify SolarTech in writing by January 31, 2010 in order to be considered for final evaluation after March 31, 2010. However, those teams notifying SolarTech prior to November 30, 2009 will enjoy public recognition at the SolarTech Permit and Installation Symposium on Dec. 3, 2009. This will be hosted at the Common Wealth Club in San Francisco. All participating teams will be included in SolarTech press releases. It's really all about marketing and promotions. Late comers enjoy less promotional support.
- SolarTech reserves the right to modify the terms and conditions as new developments dictate.

Promotional and Communication Plan

Blogs and Press Releases: additional information, insights and status provided by press releases and blogs over the next 8 weeks.

Press releases, blogs, newsletters and face-to-face conferences will be used to drive excitement and engagement; and communicate basic information. The blog site identified and the first blog launched. See www.solartech.org/blog.

Partnership collaboration with existing SolarTech partner organizations, such as but not limited to, Silicon Valley Leadership Group, BACC, DOE Market Transformation team and Solar America Cities, Joint Venture Silicon Valley, Energy Commission, CPUC Market Transformation team, etc., to drive conversation, interests and collaboration.

Successful Challenge Implementations

- Successful implementation teams will be asked to demonstrate their solutions at the SolarTech Summit, April 2010, and will be granted full Summit admission free of charge.
- Co-branding and promotional opportunities will be further discussed and offered by SolarTech. Such as, but not limited to:
    - Preferred demonstration model for any SolarTech state and nation-wide promotional campaign for online solar permitting.
    - Visible presence on the SolarTech web site, and other promotional materials.
    - Preferred vendor/partner for future project engagements solving problems in the solar industry.
- What does the winning team get?

The marketing and co-branding opportunities are huge and should not be underestimated.

If a software firm wants to get into this space, it's easily assumed they have already made the project investment decision; development funding isn't in the challenge conversation.